UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/714,840	11/18/2003	Koji Yoshida	1539.1016D	3136

21171 7590 09/23/2005

STAAS & HALSEY LLP
SUITE 700
1201 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

EXAMINER	
ATKINS, MARK ARMAND	
ART UNIT	**PAPER NUMBER**
2129	

DATE MAILED: 09/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/714,840	YOSHIDA ET AL.	
	Examiner	Art Unit	
	Mark A. Atkins	2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 18 November 2003.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 19-41 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 19-41 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 18 November 2003 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Examiner's Detailed Office Action

1. This Office Action is responsive to application 10/714,840, filed November 18, 2003.

2. Claims 19-41 have been examined.

Drawings

3. The drawings are objected to because lack of clarity. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Fig. 7 is objected to because item ST103 reads "DETERMINES IS NUMBER OF MARKS. . ." but "IS" should probably be "THE", or else if "IS" is used as a variable or other reference, this should be made clear.

Fig. 22 is objected to because it lacks the return arrow from the first box for "SEND GENERATED SOLUTION…" to the box "SET SEARCH START POINT" that the other "SEND GENERATED SOLUTION…" box had, and also that Fig. 20 had, which is probably an erroneous omission.

Fig. 23 is objected to because the axis has a label with the words "AS BEING OPTI OPTIMUM SOLUTION" in which the non-word "OPTI" should probably be omitted.

Specification Objections

4. The specification is objected to because of the following informalities.

In line 20 of the Abstract of the Disclosure "continuous" is misspelled.

Page 3, line 19, page 4, first full paragraph, and page 9, line 7 of the Specification are the first references to a "stage" but "stage" is not defined. The examiner assumes this meaning of "stage" is from the art of circuit manufacturing, and means the machine part that performs the movement of the wafer.

Page 5, line 10 of the Specification reads "n! way" instead of "n! ways". This should be corrected.

Page 5, line 14 of the Specification reads "the all conceivable orders" instead of "all conceivable orders" or "the conceivable orders". This should be corrected.

Page 32 describes Fig. 29 starting on line 21, and describes Fig. 30 starting on line 25, but the actual figures show light paths instead of populations. Either this is an error or it is not clear how the described "initial population" relates to the light paths shown in the figures.

Page 33, line 5 reads "designing method of optical system" but should probably be "designing method of an optical system" or "designing method of optical systems".

Page 47, in the first incomplete paragraph, has minor inconsistencies with spaces between the "AM" symbols and their subsequent digits, such as "AM1" versus "AM 1", and "AM 3" versus "AM4".

On pages 5 and 52 ("n alignment marks," "string of n units"), page 22 ("generation population of n"), page 70 ("n (n >1) cities"), and page 87 ("n crossovers"), the variable "n" seems to have been given at least three meanings and it is not clear which of "n" are the same, if any, and if these are the same "n" mentioned in the claims.

Claim Objections

5. The disclosure is objected to because of the following informalities.

Claims 19, 24, and 27 are objected to because the first sentence, reads “A designing method of optical system”, which lacks an article or plural. Probably “A designing method of optical systems" or “A designing method of an optical system" was intended.

Claims 19, 27, 32, and 37 are unclear because they contain parenthesized expressions “(>= 1)” so it is unclear if such expressions are part of the claims.

Claim 24 is unclear because its structure does not have a clear-cut preamble and transition phrase.

Claim 24 is objected to because the second paragraph, reads “of said plural parameters” but the first paragraph to which this phrase refers uses the term “plurality of parameters.” It would be clearer if these phrases were made consistent with each other.

Claim 32 is objected to because the first sentence, reads “A designing apparatus of optical system”, which lacks an article or plural. Probably “A designing apparatus of optical systems" or “A designing apparatus of an optical system" was intended.

None of the claims state whether the optimization process is performed on-line while the optical system is operating, versus off-line before the optical system is built. If the system is run off-line for design purposes, as is suggested by the invention title, it is not clear how the optical performance could be measured in order to optimize it since no physical optical system exists at that time. The mention of aberrations in the specification suggests that the apparatus is intended to correct physical defects which

would presumably not be known until the physical system was built. This appears to be a minor discrepancy in the disclosure that should be clarified. If the system is instead run on-line, however, it is not clear how optical parameters such as refractive index and curvature could be adjusted in real time.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

6. The following claims are rejected under 35 U.S.C. 112, 2nd paragraph, as being vague or indefinite.

Claim 19, line 3 is unclear if the phrase contained in parentheses is part of the claim, or how it relates to the claim.

Claims 19, 20, 27, 28, 32, 33, and 37 are vague because they use the term "n generation population," which is never defined, and also conflicts with several different meanings of "n" given throughout the specification. Specifically it is not clear from this phrase if the "n" in the phrase "n generation population" refers to a number of genes or a number of generations.

Claims 21, 22, 24, 27, 32, and 37 are vague because they use the term "partial space" without clearly defining this term in either the claims or the specification, and without comparing this concept to existing concepts in the literature of genetic algorithms so that the term could be understood.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 19-24, 26, 31, 36, 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Mitchell*, An Introduction to Genetic Algorithms (1997, pages 1-3, 8-11, and 156, 157) in view of *Hackenberg et al.* (USPN 5,200,603).

Regarding claim 19, *Mitchell* teaches a selection step of selecting at least two parent individuals from a population consisting of a plurality of individuals, said population being an n (>= 1) generation population (*see Mitchell,* page 10, section 1.6, step 3.a.); each individual being a real vector (*see Mitchell,* page 157, full paragraphs 4-5); a child generation step of newly generating a population of plural child individuals by applying at least one of a crossover operator and a mutation operator as a genetic operator to said parent individuals selected (*see Mitchell,* page 10, section 1.5); and a survival selection step of selecting individuals to be left as individuals in a next generation population from said n generation population and said population of child individuals (*see Mitchell,* page 10, section 1.6, step 3.a., selection based on fitness.).

Regarding claim 19, *Mitchell* does not teach each a real vector representing a candidate of an optical system to be designed. However, *Mitchell* teaches a real vector representing a candidate (*see Mitchell*, page 157, full paragraphs 4-5.). However, *Hackenberg et al.* teach a real vector representing a candidate of an optical system to be designed (*see Hackenberg et al.*, C3, L64-65, C4, L1-2, and C4, L28-30. *Examiner interprets "each of the elements described above, or two or more together" to mean that the distance parameter used in optimization could be extended to multiple element vectors of distance information.*). *Mitchell* teaches an algorithmic approach and *Hackenberg et al.* teach an application for that approach. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine *Mitchell* with *Hackenberg et al.* because arrangements of the above mentioned general type are known in the art (*see Hackenberg et al.*, C1, L15-16.).

Regarding claim 20, *Mitchell* teaches said survival selection step is a step of selecting as individuals of the next generation population individuals satisfying at least either of one or two or more evaluation criteria from said n generation population and said population of the child individuals generated (*see Mitchell,* page 1, full paragraphs 1-2, page 10, section 1.6, step 3.a., page 157, full paragraph 5, page 10, section 1.5, full paragraph 1, pages 10-11, section 1.6, page 8, section 1.5, full paragraph 1.).

Regarding claim 21, *Mitchell* teaches said child generation step said crossover operator generates, from the inside of a partial space defined by a predetermined continuous occurrence

probability distribution of occurrence probabilities set based on components of real vectors of the respective parent individuals selected, a real vector having a component of a value occurring according to the occurrence probabilities, as a child individual (*see Mitchell,* page 1, full paragraphs 1-2, page 10, section 1.6, step 3.a., page 157, full paragraph 5, page 10, section 1.5, full paragraph 1, pages 10-11, section 1.6, page 8, section 1.5, full paragraph 1.).

Regarding claim 22, *Mitchell* teaches said child generation step said mutation operator generates, from the inside of a partial space defined by a predetermined continuous occurrence probability distribution of occurrence probabilities increasing with approaching at least one parent individual out of said parent individuals selected, a real vector having a component of a value occurring according to the occurrence probabilities, as a child individual (*see Mitchell,* page 1, full paragraphs 1-2, page 10, section 1.6, step 3.a., page 157, full paragraph 5, page 10, section 1.5, full paragraph 1, pages 10-11, section 1.6, page 8, section 1.5, full paragraph 1.).

Regarding claim 23, *Mitchell* teaches said selection step, said child generation step, and said survival selection step are carried out in order plural times (*see Mitchell,* page 1, full paragraphs 1-2, page 10, section 1.6, step 3.a., page 157, full paragraph 5, page 10, section 1.5, full paragraph 1, pages 10-11, section 1.6, page 8, section 1.5, full paragraph 1.)

Regarding claim 24, *Mitchell* teaches repetitively performing generation of a population consisting of a plurality of individuals, each individual having a plurality of parameters (*see Mitchell,* pages 10-11, section 1.6.); and selection of individuals to be left as individuals in a next generation population; wherein optimization of at least one selected parameter out of said plural parameters of the individuals is effected by selecting a plurality of parent individuals out of said individuals generated (*see Mitchell,* pages 10-11, section 1.6. *Examiner considers parameters to be encoded by string representations.*), setting a predetermined continuous occurrence probability distribution of occurrence probabilities, based on the selected parameter of each of said plurality of parent individuals, and newly generating a child individual having as a value of said selected parameter a value occurring according to the occurrence probabilities, from the inside of a partial space defined by said occurrence probability distribution (*see Mitchell,* pages 10-11, section 1.6. *Examiner considers "roulette-wheel sampling" as implementing the occurrence probabilities.*).

Regarding claim 26, *Mitchell* does not teach said selected parameter of the individual is at least one of a curvature of a boundary surface in said optical element, a distance between boundary surfaces, and a refractive index of a medium placed between the boundary surfaces. However, *Hackenberg et al.* teach said selected parameter of the individual is at least one of a curvature of a boundary surface in said optical element, a distance between boundary surfaces, and a refractive index of a medium placed between the boundary surfaces (*see Hackenberg et al.*, Abstract.). *Mitchell* teaches an algorithmic approach and *Hackenberg et al.* teach an application for that approach. It would have been obvious at the time the invention was made to a person

having ordinary skill in the art to combine *Mitchell* with *Hackenberg et al.* because arrangements of the above mentioned general type are known in the art (*see Hackenberg et al.*, C1, L15-16.).

Regarding claim 31, *Hackenberg et al.* teach said component of real vector of individual is at least one of a radius of curvature of a boundary surface of said optical element, a distance between boundary surfaces, and a refractive index of a medium placed between the boundary surfaces (*see Hackenberg et al.*, Abstract. *Examiner interprets "distances between a light source and an optical element" to include "a distance between boundary surfaces," which is one of the three parameters stated in the claim*).

Regarding claim 36, *Mitchell* teaches said component of real vector of individual handled in said arithmetic section (*see Mitchell,* page 1, full paragraphs 1-2.).

Regarding claim 36, *Mitchell* does not teach at least either one of a radius of curvature of a boundary surface of said optical element, a distance between boundary surfaces, and a refractive index of a medium placed between the boundary surfaces. However, *Hackenberg et al.* teach at least either one of a radius of curvature of a boundary surface of said optical element, a distance between boundary surfaces, and a refractive index of a medium placed between the boundary surfaces (*see Hackenberg et al.*, Abstract.). *Mitchell* teaches an algorithmic approach and *Hackenberg et al.* teach an application for that approach. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine *Mitchell* with

Hackenberg et al. because arrangements of the above mentioned general type are known in the art (*see Hackenberg et al.*, C1, L15-16.).

Regarding claim 41, *Mitchell* does not teach that said component of real vector of individual is at least one of a radius of curvature of a boundary surface of said optical element, a distance between boundary surfaces, and a refractive index of a medium placed between the boundary surfaces. However, *Hackenberg et al.* teach that said component of real vector of individual is at least one of a radius of curvature of a boundary surface of said optical element, a distance between boundary surfaces, and a refractive index of a medium placed between the boundary surfaces (*see Hackenberg et al.*, Abstract.). *Mitchell* teaches an algorithmic approach and *Hackenberg et al.* teach an application for that approach. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine *Mitchell* with *Hackenberg et al.* because arrangements of the above mentioned general type are known in the art (*see Hackenberg et al.*, C1, L15-16.).

Claims 19, 24-25, 27-30, 32-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Mitchell*, <u>An Introduction to Genetic Algorithms</u> (1997, pages 1-3, 8-11, and 156, 157) in view of *Fienup* (USPN 4,607,914).

Regarding claim 19, *Mitchell* does not teach a designing method of optical system. However, *Fienup* teaches a designing method of optical system (*see Fienup,* C5, L41. *Examiner interprets*

"a method of making an optical system" via a merit function to be the same as designing an optical system.). *Mitchell* teaches an algorithmic approach and *Fienup* teaches an application for that approach. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine *Mitchell* with *Fienup* because the design optimization of optical systems is conventionally accomplished by iteratively adjusting a number of parameters until the best performance is obtained (*see Fienup*, C1, L14-16.).

Regarding claim 24, *Mitchell* does not teach a designing method of optical system. However, *Fienup* teaches a designing method of optical system (*see Fienup,* C5, L41) for the purpose of optimization as set forth in *Fienup. Mitchell* teaches an algorithmic approach and *Fienup* teaches an application for that approach. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine *Mitchell* with *Fienup* because the design optimization of optical systems is conventionally accomplished by iteratively adjusting a number of parameters until the best performance is obtained (*see Fienup*, C1, L14-16.).

Regarding claim 24, *Mitchell* does not teach representing a candidate of an optical system to be designed, said optical system including at least one optical element, or optimizing the optical system to be designed. However, *Fienup* teaches a designing method of optical system (*see Fienup,* C5, L41) for the purpose of optimization as set forth in *Fienup. Mitchell* teaches an algorithmic approach and *Fienup* teaches an application for that approach. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to

combine *Mitchell* with *Fienup* because the design optimization of optical systems is conventionally accomplished by iteratively adjusting a number of parameters until the best performance is obtained (*see Fienup*, C1, L14-16.).

Regarding claim 25, *Mitchell* teaches a population including at least said parent individuals and said child individual generated, an individual having as a value of said selected parameter a value fitting either of one or two or more evaluation criteria is selected as an individual in the next generation population (*see Mitchell,* page 1, full paragraphs 1-2, page 10, section 1.6, step 3.a., page 157, full paragraph 5, page 10, section 1.5, full paragraph 1, pages 10-11, section 1.6, page 8, section 1.5, full paragraph 1.).

Regarding claim 27, *Mitchell* teaches a parent selection step of selecting at least two real vectors to be parents, from a population of plural individuals, said population being an n (>= 1) generation population and each individual being a real vector having a component of one or two or more predetermined parameters (*see Mitchell,* page 10, section 1.6, step 3.a., page 157, full paragraph 5.); a child generation step of executing at least one of a crossover step and a mutation step, said crossover step being a step of generating, from the inside of a partial space defined and expressed by a predetermined continuous occurrence probability distribution of occurrence probabilities set based on components of the respective real vectors of said parent individuals selected, a real vector having a component of a value occurring according to the occurrence probabilities, as a child individual, and said mutation step being a step of generating, from the

inside of a partial space defined by a predetermined continuous occurrence probability distribution of occurrence probabilities increasing with approaching at least one parent individual out of said parent individuals selected, a real vector having a component of a value occurring according to the occurrence probabilities, as a child individual; and a survival selection step of selecting individuals to be left as individuals in a next generation population from said n generation population and said child individual generated (*see Mitchell,* page 10, section 1.5, full paragraph 1, page 10, section 1.6, step 3.a, pages 10-11, section 1.6, page 8, section 1.5, full paragraph 1, page 10, section 1.5, full paragraph 1, pages 10-11, page 10, section 1.5, full paragraph 1.).

Regarding claim 27, *Mitchell* does not teach a designing method of optical system, or application to optical systems. However, *Fienup* teaches a designing method of optical system (*see Fienup,* C5, L41) for the purpose of optimization as set forth in *Fienup. Mitchell* teaches an algorithmic approach and *Fienup* teaches an application for that approach. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine *Mitchell* with *Fienup* because the design optimization of optical systems is conventionally accomplished by iteratively adjusting a number of parameters until the best performance is obtained (*see Fienup*, C1, L14-16.).

Regarding claim 28, *Mitchell* teaches said survival selection step said individuals selected replace individuals not selected in said n generation population, thereby generating the next

generation population (*see Mitchell,* page 1, full paragraphs 1-2, page 10, section 1.6, step 3.a., page 157, full paragraph 5, page 10, section 1.5, full paragraph 1, pages 10-11, section 1.6, page 8, section 1.5, full paragraph 1.).

Regarding claim 29, *Mitchell* teaches said survival selection step the individuals to be left as individuals in the next generation population are selected in order from an individual fittest to a predetermined evaluation criterion and in proportion to a fitness value of each individual from the population of said parent individuals and said child individual generated (*see Mitchell,* page 1, full paragraphs 1-2, page 10, section 1.6, step 3.a., page 157, full paragraph 5, page 10, section 1.5, full paragraph 1, pages 10-11, section 1.6, page 8, section 1.5, full paragraph 1.).

Regarding claim 30, *Mitchell* teaches said survival selection step an individual satisfying at least either of one or two or more evaluation criteria is selected as an individual in the next generation population from the population of said parent individuals and said child individual generated (*see Mitchell,* page 1, full paragraphs 1-2, page 10, section 1.6, step 3.a., page 157, full paragraph 5, page 10, section 1.5, full paragraph 1, pages 10-11, section 1.6, page 8, section 1.5, full paragraph 1.).

Regarding claim 32, *Mitchell* teaches comprising an arithmetic section for repetitively executing generation of plural parameters, and selection of parameters to be left out of the plural

parameters generated, and a memory for temporarily storing the parameters generated, wherein said arithmetic section executes at least a parent selection step of selecting at least two real vectors to be parents, from an n (>= 1) generation population consisting of a plurality of real vectors given as said plural parameters (*see Mitchell,* page 1, full paragraphs 1-2, page 10, section 1.6, step 3.a., page 157, full paragraph 5. *Examiner interprets "electronic computers" to include arithmetic and logic units (ALUs), and that an ALU is the same as an "arithmetic section."*); a child generation step of executing at least one of a crossover step and a mutation step, said crossover step being a step of generating, from the inside of a partial space defined by a predetermined continuous occurrence probability distribution of occurrence probabilities set based on components of the respective real vectors of said parent individuals selected, a real vector having a component of a value occurring according to the occurrence probabilities, as a child individual, and said mutation step being a step of generating, from the inside of a partial space defined by a predetermined continuous occurrence probability distribution of occurrence probabilities increasing with approaching at least one parent individual out of said parent individuals selected, a real vector having a component of a value occurring according to the occurrence probabilities, as a child individual; and a survival selection step of selecting individuals to be left as individuals in a next generation population from said n generation population and said child individual generated (*see Mitchell,* page 10, section 1.5, full paragraph 1, page 10, section 1.6, step 3.a, pages 10-11, section 1.6, page 8, section 1.5, full paragraph 1, page 10, section 1.5, full paragraph 1, pages 10-11, page 10, section 1.5, full paragraph 1.).

Regarding claim 32, *Mitchell* does not teach a designing apparatus of optical system, or application to optical systems, each representing a candidate of an optical system to be designed, said optical system including at least one optical element, thereby optimizing the optical system to be designed. However, *Fienup* teaches a designing method of optical system (*see Fienup,* C5, L41) for the purpose of optimization as set forth in *Fienup. Mitchell* teaches an algorithmic approach and *Fienup* teaches an application for that approach. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine *Mitchell* with *Fienup* because the design optimization of optical systems is conventionally accomplished by iteratively adjusting a number of parameters until the best performance is obtained (*see Fienup*, C1, L14-16.).

Regarding claim 33, *Mitchell* teaches said survival selection step the arithmetic section replaces individuals not selected in said n generation population by said selected individuals, thereby generating the next generation population (*see Mitchell,* page 1, full paragraphs 1-2, page 10, section 1.6, step 3.a., page 157, full paragraph 5, page 10, section 1.5, full paragraph 1, pages 10-11, section 1.6, page 8, section 1.5, full paragraph 1.).

Regarding claim 34, *Mitchell* teaches said survival selection step said arithmetic section selects the individuals to be left as individuals in the next generation population in order from an individual fittest to a predetermined evaluation criterion and in proportion to a fitness value of each individual from the population of said parent individuals and said child individual generated

(*see Mitchell,* page 1, full paragraphs 1-2, page 10, section 1.6, step 3.a., page 157, full paragraph 5, page 10, section 1.5, full paragraph 1, pages 10-11, section 1.6, page 8, section 1.5, full paragraph 1.).

Regarding claim 35, *Mitchell* teaches said survival selection step said arithmetic section selects an individual satisfying at least either of one or two or more evaluation criteria as an individual in the next generation population from the population of said parent individuals and said child individual generated (*see Mitchell,* page 1, full paragraphs 1-2, page 10, section 1.6, step 3.a., page 157, full paragraph 5, page 10, section 1.5, full paragraph 1, pages 10-11, section 1.6, page 8, section 1.5, full paragraph 1.).

Regarding claim 37, *Mitchell* teaches a medium in which a program is recorded, said program comprising: a parent selection step of selecting at least two real vectors to be parents, from a population of plural individuals; said population being an n (>= 1) generation population and each individual being a real vector; a child generation step of executing at least one of a crossover step and a mutation step, said crossover step being a step of generating, from the inside of a partial space defined by a predetermined continuous occurrence probability distribution of occurrence probabilities set based on components of the respective real vectors of said parent individuals selected, a real vector having a component of a value occurring according to the occurrence probabilities, as a child individual, and said mutation step being a step of generating, from the inside of a partial space defined by a predetermined continuous occurrence probability

distribution of occurrence probabilities increasing with approaching at least one parent individual out of said parent individuals selected, a real vector having a component of a value occurring according to the occurrence probabilities, as a child individual; and a survival selection step of selecting individuals to be left as individuals in a next generation population from said n generation population and said child individual generated (*see Mitchell,* page 1, full paragraphs 1-2, page 10, section 1.6, step 3.a., page 157, full paragraph 5, page 10, section 1.5, full paragraph 1, pages 10-11, section 1.6, page 8, section 1.5, full paragraph 1. *Examiner interprets programs on electronic computers to imply programs being recorded on a computer readable medium.*).

Regarding claim 37, *Mitchell* does not teach a candidate of an optical system to be designed. However, *Fienup* teaches a candidate of an optical system to be designed (*see Fienup,* C5, L41-42, and C6, L1-2. *Examiner interprets a merit function for designing an optical system to automatically include components that are candidates.*). *Mitchell* teaches an algorithmic approach and *Fienup* teaches an application for that approach. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine *Mitchell* with *Fienup* because the design optimization of optical systems is conventionally accomplished by iteratively adjusting a number of parameters until the best performance is obtained (*see Fienup*, C1, L14-16.).

Regarding claim 37, *Mitchell* does not teach having a component of one or two or more predetermined parameters featuring the optical system. However, *Fienup* teaches having a component of one or two or more predetermined parameters featuring the optical system (*see Fienup,* C5, L41-42, and C6, L1-4. *Examiner interprets a merit function for designing an optical system "including at least one holographic optical element" to include "two or more" parameters.*). *Mitchell* teaches an algorithmic approach and *Fienup* teaches an application for that approach. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine *Mitchell* with *Fienup* because the design optimization of optical systems is conventionally accomplished by iteratively adjusting a number of parameters until the best performance is obtained (*see Fienup*, C1, L14-16.).

Regarding claim 38, *Mitchell* teaches said program recorded therein is arranged so that in said survival selection step said individuals selected replace individuals not selected in said n generation population, thereby generating the next generation population (*see Mitchell,* page 1, full paragraphs 1-2, page 10, section 1.6, step 3.a., page 157, full paragraph 5, page 10, section 1.5, full paragraph 1, pages 10-11, section 1.6, page 8, section 1.5, full paragraph 1.).

Regarding claim 39, *Mitchell* teaches said program recorded is arranged so that in said survival selection step the individuals to be left-as individuals in the next generation population are selected in order from an individual fittest to a predetermined evaluation criterion and in proportion to a fitness value of each individual from the population of said parent individuals and

said child individual generated (*see Mitchell,* page 1, full paragraphs 1-2, page 10, section 1.6, step 3.a., page 157, full paragraph 5, page 10, section 1.5, full paragraph 1, pages 10-11, section 1.6, page 8, section 1.5, full paragraph 1.).

Regarding claim 40, *Mitchell* teaches said program recorded is arranged so that in said survival selection step an individual satisfying at least either of one or two or more evaluation criteria is selected as an individual in the next generation population from the population of said parent individuals and said child individuals generated (*see Mitchell,* page 1, full paragraphs 1-2, page 10, section 1.6, step 3.a., page 157, full paragraph 5, page 10, section 1.5, full paragraph 1, pages 10-11, section 1.6, page 8, section 1.5, full paragraph 1.).

Regarding claim 40, *Mitchell* teaches a program recorded is arranged (*see Mitchell,* page 1, full paragraphs 1-2).

Correspondence Information

9. Any inquiries concerning this communication or earlier communications from the examiner should be directed to Mark A. Atkins, who may be reached Monday through Friday, between 8:00 a.m. and 5:00 p.m. EST, or via telephone at (571) 272-5532 or facsimile transmission (571) 273-5532 or e-mail mark.atkins@uspto.gov.

If you need to send an Official facsimile transmission, please send it to (571) 273-8300.

If attempts to reach the examiner are unsuccessful the Examiner's Supervisor, Anthony Knight, may be reached at (571) 272-3687.

Hand-delivered responses should be delivered to the Receptionist @ (Customer Service Window Randolph Building 401 Dulaney Street Alexandria, VA 22313), located on the first floor of the south side of the Randolph Building.

Anthony Knight
Supervisory Patent Examiner
TC 2100

Sunday, August 21, 2005

MAA